Inventory and Monitoring Plan

for

Salt Plains National Wildlife Refuge

February 6, 2014

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Signatures

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For: Salt Plains National Wildlife Refuge

Action	*Signature /Printed Name*	*Date*
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A. Introduction

Salt Plains National Wildlife Refuge (NWR) was established by President Herbert Hoover in Executive Order 5314, dated March 26, 1930, "…*as a refuge and breeding ground for birds*..." Salt Plains NWR is administered under 16 U.S.C. § 715d (Migratory Bird Conservation Act) "...*for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.*", 16 U.S.C. § 664 (Fish and Wildlife Coordination Act) "...*shall be administered by him (Secretary of the Interior) directly or in accordance with cooperative agreements... and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon,...*", 16 U.S.C. § 742f(a)(4) (Fish and Wildlife Act of 1956) "…*for the development, advancement, management, conservation, and protection of fish and wildlife resources*…", and 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956) "…*for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude*…" The original boundary of Salt Plains NWR was expanded when Executive Orders No. 7925 (July 5, 1938) and 8089 (April 13, 1939) were authorized by the War Department to acquire the lake property. Public Land Order No. 144 (June 24, 1943) authorized by Executive Order No. 9337 (April 24, 1943) combined original refuge land with War Department land. Additional land was purchased by Duck Stamp money and the Posey tract was donated in 1990 (See CCP, appendix G for further legal mandate information). Salt Plains NWR was also designated as critical habitat for the whooping crane (*Grus americana*; 43 FR 20938, May 15, 1978). Salt Plains NWR encompasses 32,197 acres along the Salt Fork of the Arkansas River. This includes the majority of the Great Salt Plains Lake, the salt flats to the west, and wetlands and uplands along the drainages entering the lake. The surrounding area consists of flat prairies to gently rolling hills, much of which has been put into agriculture.

For each refuge, an Inventory and Monitoring plan (IMP) is used to support implementation of adaptive management, particularly evaluating whether management actions are achieving desired results (refuge goals and objectives). Inventory and Monitoring (I&M) program efforts at the refuge level also should help evaluate the effects of environmental stressors (including climate change) over time.

A survey is a specific data collection effort to complete an inventory or conduct monitoring of biotic or abiotic resources. An inventory documents the presence, relative abundance, status, and/or distribution of abiotic resources (e.g., soil types, water quality and quantity), species, habitats, or ecological communities at a particular time. Biotic inventories can benchmark extant species assemblages and functional groups before accelerated climate change and non-climate stressors cause extinctions and species redistributions. Inventories provide a foundation to develop monitoring objectives for a well-designed monitoring program. New data resulting from inventories may also be used to assess current management priorities and assist with evaluation of species vulnerability to climate change and other stressors in the future.

Monitoring is a survey repeated through time to determine changes in the status and/or demographics of abiotic and biotic resources (e.g., fish, wildlife, plants, habitats, ecological

communities). Based upon the recently drafted I&M policy (863 FW 1), there are two types of monitoring: surveillance and targeted. Surveillance monitoring documents the status or change over time of a resource. Examples include monitoring climatic parameters, species population trend over time, disease incidence, contaminants, or wilderness character. In contrast, targeted monitoring assesses whether a natural resource responds to one or more management actions or stressors in a previously specified way. Targeted is the primary monitoring type used in an adaptive management context for evaluating progress towards achievement of refuge management objectives.

This IMP documents the inventory and monitoring surveys that will or could be conducted at Salt Plains NWR from 2013 through 2028, or until the refuge Comprehensive Conservation Plan (CCP) or Habitat Management Plan (HMP) are revised. Salt Plains NWR is preparing the following IMP to evaluate biotic and abiotic resources found within the refuge and surrounding area. The goal of the IMP is to aid in developing and evaluating management strategies for this refuge.

B. Methods

All current and/or foreseen desired surveys were entered into the Planning and Review of I&M Activities on Refuges (PRIMR) database in 2011. The initial ranking of surveys in PRIMR was determined by Glen Hensley, Refuge Biologist. As per instruction of the Zone Biologists (Bill Johnson and Paige Schmidt), several desired inventory, monitoring, and research efforts were included in PRIMR that the refuge was not actively conducting at the time.

All surveys included in PRIMR were reprioritized in the process of drafting the IMP. Reprioritizing of surveys indirectly consisted of 13 criteria outlined in the Simple Multi-Attribute Rating Technique (SMART) tool, without formally going through the process. The prioritization process involved individual rankings of currently entered surveys by refuge staff, including; Greg Birkenfeld, Refuge Manager, Barry Smart, Assistant Refuge Manager, and Glen Hensley, Refuge Biologist. Refuge staff then collectively went through each survey ranking to form consensus with regards to ranking criteria. The prioritization was used to determine the order of discussion for final survey ranking and selection.

Survey selection occurred during a two-day workshop held August 13–14, 2013. Refuge staff, including; Refuge Manager Greg Birkenfeld, Assistant Refuge Manager Barry Smart, and Refuge Biologist Glen Hensley, and Zone Biologists Paige Schmidt and Bill Johnson collectively discussed selection of surveys and rankings. During the workshop, surveys were selected for inclusion in the IMP, assigned to one of two categories (Current or Expected), and sequentially ranked (Table 1). Refuge Manager Greg Birkenfeld was the selecting official for surveys. Inventory and monitoring activities that received final inclusion in the table were considered efforts that could be maintained or implemented during the life of the Inventory and Monitoring Plan.

Current surveys were selected according to whether there are existing refuge resources to continue with data collection, protocol development, analysis and reporting. It was intended that this top tier selection would be the main focus of current I&M activities at Salt Plains NWR and

that these surveys would be fully developed (i.e., protocol development, analysis, and reporting) before lower priority (i.e., Expected) surveys are addressed. The top tier surveys could help meet the Salt Plains NWR goals and objectives with the current efforts of the refuge staff. The lower priority surveys are surveys that could be conducted in the future but are not yet currently funded, implemented, and/or need additional support.

The Expected category of surveys were ranked according to how the refuge views them as a conservation priority with recognition that many will need significant additional resources, conceptual development to provide objectives linked to management priorities or efforts, as well as partner development and contribution. They were selected in the hope that this support would occur sometime during the lifespan of the IMP. As a result, the Expected category of surveys will be addressed as resources or opportunities become available (i.e., assistance with protocol development, data management, and analysis at the landscape, regional, national, or international levels), not necessarily in the order ranked.

Non-selected surveys were those that were listed in PRIMR and represent work that has been completed, are not expected to meet the goals of protocol development, analysis and reporting, or are surveys conducted to assist cooperators with data collection but where the cooperator is not expected to develop a protocol or provide information to the refuge.

Staff time and costs for selected surveys that can be conducted with available refuge resources (i.e., Current surveys) were estimated based on the amount of time spent planning, collecting, and analyzing or using data (i.e., development of habitat management prescriptions) in previous years. We estimated it would take approximately 754.7 FWS staff hours to conduct the selected "current" surveys within a year. Staff time and costs for selected surveys that require additional funding, support, or justification were not estimated.

C. Results

Following the selection and ranking process, 13 surveys were selected for inclusion in Salt Plains NWR's IMP (Table 1). Nine of these surveys can be conducted given the current capacity of this refuge. The remaining 4 surveys will be conducted with additional funds or staff once obtained by the refuge. There were 9 surveys that were not-selected. The selected surveys are in Table 1 and the narratives follow.

Table 1. Selected surveys.

Station or Complex Name: Salt Plains NWR

Survey Priority[0]	Survey ID Number[1]	Survey Name[2]/ Type[3]	Survey Status[4]	Mgmt. Obj. Id[5]	Survey Area[6]	Staff Time (FTE)[7]	Annual Cost (OPR)[8]	Survey Timing[9]	Survey Length[10]	Survey Coord.[11]	Protocol Citation[12]	Protocol Status[13]
1	FF02RKSP00-016	Snowy Plover Survey (M)	Current	CCP	Salt Flats Unit	0.03	$1,000	Peak breeding season - April/May	2013-2018	G. Hensley, Refuge Biologist	Thomas et al. 2012	S/ Initial Survey Instructions
2	FF02RKSP00-017	Water Resource Inventory and Assessment (M)	Current	CCP& FWS 2010 Operational Blueprint	Entire station	0.04	$1,000	Cont. Monitoring / Year Round	2014 - Indefinite	P. Burck, R2 Hydrologist	(none)	S/ Initial Survey Instructions
3	FF02RKSP00-018	Waterfowl Habitat Assessment and Quantification (M)	Current	CCP	Entire Station & Off Refuge	0.1	$100	TBD/One Time	2015/One Time	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
4	FF02RKSP00-003	Ground-Based Waterfowl Survey (M)	Current	CCP	Entire Station	0.12	$250	Sept. - Mar.	1943 - Indefinite	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
5	FF02RKSP00-011	Aquatic Invertebrate Survey (I)	Current	NA	Moist Soil & Wetland Management Units	0.04	$75	TBD	2015	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
6	FF02RKSP00-006	International Shorebird Survey (CI)	Current	CCP	Salt Flats Unit, Casey Unit, and Sand Creek Bay	0.05	$125	Mar. 15 - Oct. 15	1991 - Indefinite	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
7	FF02RKSP00-015	Invasive Plant Monitoring (M)	Current	CCP	Entire Station	0.04	$100	Jul. - Sept. / Peak growing season	2013 - Indefinite	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
8	FF02RKSP00-014	Vegetation Surveys (M)	Current	CCP / FMP	Entire Station	0.04	$100	Jul. - Sept. / Peak growing season	2012 - Indefinite	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions

Survey Priority[0]	Survey ID Number[1]	Survey Name[2]/ Type[3]	Survey Status[4]	Mgmt. Obj. Id[5]	Survey Area[6]	Staff Time (FTE)[7]	Annual Cost (OPR)[8]	Survey Timing[9]	Survey Length[10]	Survey Coord.[11]	Protocol Citation[12]	Protocol Status[13]
9	FF02RKSP00-009	Coordinated Spring Survey of Mid-continent Sandhill Cranes (CM)	Current	None	Entire station	0.004	$0	Last Tuesday in March, Annually	2005 - Indefinite	D. Collins, Regional Mig. Bird Biol./G. Hensley, Refuge Biologist	(none)	N/ Initial Survey Instructions
10	FF02RKSP00-019	Landbird Survey (M)	Expected	CCP	All vegetated management units	NA	NA	TBD	Future/TBD	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
11	FF02RKSP00-007	White-tailed Deer Herd Health Assessment (CM)	Expected	CCP / RHP	Entire Station	NA	NA	TBD	Future/TBD	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
12	FF02RKSP00-020	Freshwater Mussel Survey (I)	Expected	CCP	Entire Station	NA	NA	TBD	Future/TBD	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions
13	FF02RKSP00-021	Fire Effects Monitoring (M)	Expected	CCP / FMP	Entire Station	NA	NA	During RX Burning Actions	Future/TBD	G. Hensley, Refuge Biologist	(none)	S/ Initial Survey Instructions

0: The rank for each survey listed in order of priority (e.g., numeric, tiered, alpha-numeric, or combination of these).
1: A unique identification number consisting of: [station organization code]-[sequential number].
2: Short titles for the survey name, preferably the same names in station work plans.
3: Type of survey (I=Inventory, CI=Coop Inventory, BM=Baseline Monitoring, CB=Coop Baseline Monitoring, M=Monitoring to Inform Management, CM=Coop Monitoring to Inform Management, R=Research, CR=Coop Research).
4: Surveys planned for the lifespan of this IMP (e.g., Current, Expected,).
5: The management plan and objectives that justify the described survey.
6: Station management unit names, entire station, or names of other landscape units included in the survey.
7: Estimates of Service (FWS) and non-Service (Other) staff time needed to complete the survey.
8: Average annual operations costs for conducting the survey (e.g., equipment, contracts, travel) not including staff time.
9: Timing and frequency of survey field activities.
10: The years during which the survey has been or will be conducted.
11: Name and position of the Survey Coordinator for each survey.
12: Title, author, and version of the survey protocol (if there is no protocol to cite, enter None).

13. Scale of intended use (S=Site-specific, R=Regional, or N=National) and stage of approval (Initial Survey Instructions, Complete Draft, In Review, or Approved) of the survey protocol.

Narratives of Selected Surveys

Current: Selected Surveys That Can Be Conducted With Available Refuge Resources

1. Snowy Plover Survey (FF02RKSP00-016)

Salt Plains NWR is of continental significance to snowy plovers (*Charadrius alexandrinus*; Gorman and Haig 2002, Page et al. 2009, Thomas et al. 2012). Approximately 23% of the North American population, and 32% of the Interior population, breed at Salt Plains NWR (Thomas et al. 2012). The most recent (2007-2008) survey suggests the breeding population at Salt Plains NWR ranges from 3,692 – 6,868 (Thomas et al. 2012), and the Refuge has arguably the highest breeding density in North America. Salt Plains NWR also has perhaps the highest numbers of fall and spring migrants in interior North America (Skagen et al. 1999). Salt Plains NWR primary objective for conducting surveys of snowy plovers breeding on refuge is to understand snowy plover use (breeding numbers, abundance, distribution) over a number of years with variable environmental conditions (e.g., variable water conditions due to regional precipitation and off Refuge water use). A secondary objective is to understand how management actions, such as removal of salt cedar (Tamarix spp.) might influence snowy plovers (Koenen et al. 1996). This survey currently will be used to inform refuge management objectives, including; CCP Goal 2, Objectives 1, & 6. The importance of Salt Plains NWR to snowy plovers was not realized until after the completion of the CCP in 2006; future revisions to the CCP should include more goals and objectives relevant to snowy plovers.

Population/Community of interest:

Currently, this survey focuses on the breeding snowy plover population on the Salt Flats Management Unit. Smaller distinct salt and alkali flats may be targeted in the future for determination of use as breeding grounds and monitored as needed.

Partnerships/Cooperators/Linkages:

This survey is conducted in cooperation with staff from Salt Plains NWR, Migratory Bird Management Office, several surrounding refuges and partners with interest in snowy plovers. This survey links to goals and/or objectives set forth by cooperating partners, including; Great Plains Landscape Conservation Cooperative - priority species, Playa Lakes Joint Venture Bird Conservation Region (BCR) 19 - priority species, and Oklahoma Department of Wildlife Conservation Comprehensive Wildlife Conservation Strategy – species of greatest conservation need. Further, snowy plover was included in a selection of priority species for the Great Plains LCC.

Protocol status:

Current survey protocols were adapted from a national peer-reviewed published protocol, Thomas et al. 2012, that included Salt Plains NWR. A site-specific I&M survey protocol is in development.

2. Water Resource Inventory and Assessment (FF02RKSP00-017)

A water resource inventory and assessment (WRIA) will identify potential concerns and/or threats to water resources by synthesizing and evaluating information pertaining to water infrastructure, features, monitoring efforts, rights, quantity, quality, management, potential acquisitions, threats, and other issues. This is an assessment of both groundwater and surface water resources at Salt Plains NWR, and surrounding landscape. Groundwater is believed to drive surface water in saline lakes and associated springs. Subsequently, surface water on saline lakes impacts the ability of the refuge to provide important nesting, foraging, and roosting habitat for priority species, such as; snowy plovers, sandhill cranes (*Grus canadensis*), waterfowl, waterbirds, shorebirds, and aquatic resources. Variation in water quality and quantity also impact the ability of the refuge to provide designated critical habitat for endangered whooping crane. Groundwater removal, surface water use, and potential contaminant release/discharge from commercial and municipal interests within the Salt Fork of the Arkansas River watershed all have the potential to affect water quality and quantity on refuge. Thus, understanding trends in groundwater decline and developing a plan for addressing how groundwater trends impact the mission of the refuge is of paramount importance. This survey was selected because of its critical importance in helping the refuge address their mission and develop contingency plans if necessary. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 1, 2, 4, 5, & 7; CCP Goal 2, Objective 5; CCP Goal 3; CCP Goal 4, Objective 1, & 3.

Population/Community of interest:

Groundwater and surface water resources within the boundary of the refuge, and groundwater and surface water resources off-refuge that may impact the refuge. Residential, commercial, municipal, and agricultural activities rely heavily on groundwater wells for supply in regards to each activities uses. An oil and gas exploration boom within the past few years has potentially exacerbated water quality and quantity issues by increasing both demand and potential contaminant point sources.

Partnerships/Cooperators/Linkages:

There survey is being led by Region 2 (NWRS-Division of Water Resources). Collaboration with US Geological Survey, Oklahoma Water Resources Board, and the Oklahoma State University Extension Office is necessary to access long-term groundwater monitoring information both on and off-refuge. Methodology and databases for WRIAs were developed by the FWS Hydrology Branch of the NWRS and supported through I&M. This survey links to survey 4- Ground-Based Waterfowl Survey (FF02RKSP00-003).

Protocol status:

A written site-specific description of the steps employed in conducting the WRIA at Salt Plains NWR will be prepared by Peter Burck, Region 2 Hydrologist. Data is being housed by Region 2 Division of Water Resources and results will be leveraged to develop what information is needed and the best way to monitor.

3. Waterfowl Habitat Assessment and Quantification (FF02RKSP00-018)

Salt Plains NWR was established to protect and enhance habitat for migratory birds (including waterfowl and sandhill cranes). In addition to water levels in saline lakes, the other major factor that drives waterfowl and sandhill crane use of Salt Plains NWR is available foraging habitat (e.g., milo, winter wheat) on the refuge and surrounding landscapes. Measuring energetic carrying capacity of habitats is arguably the best method of quantifying refuge contributions for migrating and wintering waterfowl. Techniques to measure energetic capacity for most if not all habitats are readily available; moreover, suitable energetic carrying capacity values exist in published literature for many habitats available on the refuge. Waterfowl and sandhill cranes use saline lakes on the refuge for nocturnal roosting/diurnal loafing, but make daily flights to forage in surrounding landscape during daylight hours. Changing energetic carrying capacity in the landscape has the potential to affect local energetic carrying capacity for migrating/wintering waterfowl and sandhill cranes and subsequently number of birds utilizing the refuge. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 5.

Population/Community of interest:

Waterfowl and sandhill crane habitat on refuge and surrounding landscape during migration and winter.

Partnerships/Cooperators/Linkages:

Migratory Bird Management Office, Partners for Fish and Wildlife,
Oklahoma Department of Wildlife Conservation (ODWC), Playa Lakes Joint Venture (PLJV),
This survey links to Surveys 4- Weekly Waterfowl Survey (FF02RKSP00-003) and 5- Aquatic Invertebrate Survey (FF02RKSP00-011).

Protocol status:

No site-specific protocol or survey protocol framework is available but methodology is available from which to develop a protocol. Similar protocol development efforts will be developed at Sequoyah, Little River, and Washita NWRs.

4. Ground-Based Waterfowl Survey (FF02RKSP00-003)

Salt Plains NWR hosts large numbers of migratory waterfowl and cranes during migration and throughout the winter. This survey effort is used to aide refuge management with providing relative abundance of species utilizing the refuge, monitoring migration phenology, and providing long-term trend indices. Linking this survey with the waterfowl habitat assessment and quantification, and the aquatic invertebrate survey will further aide refuge habitat management. Results from the survey are also highly sought after by the general public. Hunters and birders often inquire for these numbers and use them to plan outdoor recreational activities. It is also during this survey in which the refuge monitors for the presence of whooping cranes. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 5; CCP Goal 2, Objective 1.

Population/Community of interest:

The relative abundance of ducks, geese, and cranes that utilize the refuge for roosting. Other species are noted as part of the survey.

Partnerships/Cooperators/Linkages:

This survey will be linked to surveys 2- Water Resource Inventory and Assessment (FF02RKSP00-017), 3- Waterfowl Habitat Assessment and Quantification (FF02RKSP00-018), and 5- Aquatic Invertebrate Survey (FF02RKSP00-011).

Protocol status:

A survey protocol/SOP is in development that standardizes data collection, identifies limitations of data and appropriate use.

5. Aquatic Invertebrate Survey (FF02RKSP00-011)

An aquatic invertebrate survey is necessary as part of Salt Plains NWR's management for waterfowl and other waterbirds. Aquatic invertebrates are an important food source for molting and pre-nesting bird species. Other wildlife species also rely on aquatic invertebrates as a key food source. Understanding the relative abundance of aquatic invertebrates and linking that information with the Waterfowl Habitat Assessment and Quantification, and the Ground-Based Waterfowl Survey will aide refuge habitat management. Invertebrate abundance contributes to energetic carrying capacity of both shorebirds and waterfowl, and thus will factor into decisions concerning management of shorebird/waterfowl food resources, including management plans for wetlands and moist-soil units. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 5 & 7; CCP Goal 4, Objective 3.

Population/Community of interest:

Aquatic invertebrates within managed wetlands and moist-soil units as forage sources for migratory waterfowl and other waterbirds.

Partnerships/Cooperators/Linkages:

This survey will be linked with surveys 3- Waterfowl Habitat Assessment and Quantification (FF02RKSP00-018) and 4- Weekly Waterfowl Survey (FF02RKSP00-003).

Protocol status:

No site-specific protocol is currently developed. Methods do exist in the published literature and may be modified into a site-specific protocol.

6. International Shorebird Survey (FF02RKSP00-006)

Salt Plains NWR is designated as a Western Hemisphere Shorebird Reserve Network site of regional importance with potential to be considered a hemispheric or internationally important shorebird site. This shorebird Survey is in cooperation with the International Shorebird Surveys (ISS), organized by the Manomet Bird Observatory to collect information on shorebirds and the wetlands used during migration. This survey is used to determine relative species abundance and distribution across the refuge. A published report by Skagen et al. (1999) identified Salt Plains NWR as an important site for multiple shorebird species (i.e., among the sites with the highest counts for each species during migration) including; spotted sandpiper (*Actitis macularius*), semipalmated sandpiper (*Calidris pusilla*), white-rumped sandpiper (*Calidris fuscicollis*), western sandpiper (*Calidris mauri*), Baird's sandpiper(*Calidris bairdii*), least sandpiper (*Calidris minutilla*), greater yellowlegs (*Tringa melanoleuca*), semipalmated plover (*Charadrius semipalmatus*), and snowy plover. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 4; CCP Goal 2, Objective 1.

Population/Community of interest:

Migrating and breeding shorebirds from Spring through Fall.

Partnerships/Cooperators/Linkages:

Data collection is consistent with other international shorebird monitoring frameworks so data will roll up to Manomet Bird Observatory.

Protocol status:

Framework that describes survey frequency and local site variation in survey length was produced by Manomet Bird Observatory. A site-specific protocol will be developed to describe local spatial design.

7. Invasive Plant Monitoring (FF02RKSP00-015)

Salt Plains NWR is currently infested with an unknown amount of salt cedar (*Tamarix spp.*), johnsongrass (*Sorghum halepense*), pampass grass (*Cortaderia spp.*), wild *Cannabis sativa*, musk thistle (*Carduus nutans*), bull thistle (*Cirsium vulgare*), *Phragmites australis*, and eastern red cedar (*Juniperus virginiana*). Infestations are currently expanding and denude habitat for priority wildlife including snowy plovers, interior least terns (*Sternula antillarum athalassos*), whopping cranes, migratory and wintering waterfowl, sandhill cranes, shorebirds, and grassland birds. Many invasive plants can also impact the availability of surface and groundwater. Monitoring invasive plant communities and understanding the threats they impose is important to the mission of Salt Plains NWR. As part of monitoring, invasive species will be mapped to prioritize and evaluate treatment and retreatment. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 1 & 6; CCP Goal 2, Objective 2.

Population/Community of interest:

All refuge habitats are currently affected or will be affected without extensive control efforts.

Partnerships/Cooperators/Linkages:

Invasive Species Coordinator for Oklahoma and Texas, The National Wild Turkey Federation is a potential cooperator for invasive species treatment along riparian corridors . This information could be used in conjunction with survey 1-Snowy Plover Surveys (FF02RKSP00-016) to determine influence of salt cedar invasion on bird use and nest success. This monitoring effort will also be linked to surveys 8- Vegetation Monitoring (FF02RKSP00-014) and 13- Fire Effects Monitoring (FF02RKSP00-021).

Protocol status:

No site-specific protocol is currently developed; however, methodology is available from which to develop a protocol.

8. Vegetation Monitoring (FF02RKSP00-014)

In conjunction with developing desired vegetation conditions for the refuge, this survey is needed to assess the short and long-term response of vegetation to environmental conditions and management actions. Intent is to establish desired vegetation/range conditions for Salt Plains NWR and establish a vegetation monitoring effort that will capture vegetation conditions and response to management actions. This effort will aide the refuge in determining long-term trends of change over time in species composition, cover, and structure, and effects of treatments including wild and prescribed fire, mechanical removal of eastern red cedar, salt cedar, invasive species control, and grazing if continued. Habitat management actions can then be modified/adapted relative to desired conditions determined by priority species habitat needs. This survey will be used to inform refuge management objectives, including; CCP Goal 1, Objective 3 & 7; CCP Goal 2, Objective 1 & 2.

Population/Community of interest:

All vegetated management units of Salt Plains NWR receiving and/or potentially receiving active habitat management.

Partnerships/Cooperators/Linkages:

Potential partners include agencies with expertise in vegetation monitoring, including the USDA-Natural Resource Conservation Service, the National Park Service, and universities. This monitoring effort will be linked to surveys 7- Invasive Plant Monitoring (FF02RKSP00-015) and13- Fire Effects Monitoring (FF02RKSP00-021)

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Protocol status:

Current survey protocols were adapted from FEAT (Fire Ecology Assessment Tool) and FireMon (Fire Effects Monitoring and Inventory Protocol) Integration (i.e., FFI) developed in cooperation with the National Park Service, U.S. Forest Service, Systems for Environmental Management and Spatial Dynamics and funded by the National Interagency Fuels Coordination Group. A site-specific I&M survey protocol will be developed.

9. Coordinated Spring Survey of Mid-continent Sandhill Cranes (FF02RKSP00-009)

This survey is conducted as part of the larger, Central Flyway wide survey of the mid-continent population of sandhill cranes. Information generated from this survey is the only index used in tracking and managing sandhill cranes at the population level. It is conducted during the last Tuesday in March, when sandhill cranes are typically concentrated on the Platte River. Survey effort is most intense along the Platte River and in the Rainwater Basin, and includes both ground surveys, aerial surveys, and photo corrected surveys for these regions. The protocol calls for discrete sites north and south of the Platte River, such as Muleshoe, Grulla, and Salt Plains NWR, to count cranes on this same date. Typically, most cranes have migrated north by the survey date. However, Salt Plains NWR holds a significant number of sandhill cranes throughout the winter, and is included as a discrete site because sandhill cranes could be present during survey dates. This survey was selected over others because it informs population management, including harvest management, of lesser sandhill cranes. Sound population management of this species is a priority of USFWS-Migratory Bird Management Office. This survey requires a minimal effort (one morning of survey effort) and can typically be performed as part of routine refuge reconnaissance activities.

Population/Community of interest:

All sandhill cranes utilizing Salt Plains NWR on the survey date (last Tuesday in March).

Partnerships/Cooperators/Linkages:

The annual report for this survey is produced by the USFWS-Migratory Bird Management Office <www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus.html>. Partners include the Central Flyway and state wildlife agencies. State wildlife agencies are typically the lead for survey efforts within their respective states. Information reported from Salt Plains NWR (including negative data) is reported first through Oklahoma Department of Wildlife Conservation. Information at the state level is collated and sent to the USFWS-Migratory Bird survey lead.

Protocol status:

No site-specific protocol is currently developed. It is believed that because this is a regionally coordinated survey, a regional protocol framework will be developed and then adapted to discrete survey sites.

Expected: Selected Surveys That Require Additional Funding, Support, Or Justification

10. Landbird Survey (FF02RKSP00-019)

This survey will estimate density, occupancy, species diversity, and species richness of grassland, shrubland, and riparian bird guilds on Salt Plains NWR each year. It will assist the refuge in tracking both short and long term response of these birds to habitat conditions and management actions. Data will be collected by adapting a framework currently developed by the Rocky Mountain Bird Observatory that allows the information to be available for landscape level analysis. This survey was considered important because it will inform habitat management efforts, which are largely undertaken to influence grassland bird species, such as Cassin's sparrow (*Peucaea cassinii*), grasshopper sparrow (*Ammodramus savannarum*), Bell's vireo (*Vireo bellii*), red-headed woodpecker (*Melanerpes erythrocephalus*), and northern bobwhite quail (*Colinus virginianus*). This survey will be used to inform refuge management objectives, including; CCP Goal 2, Objective 1, 3, 6, & 9.

Population/Community of interest:

Grassland, shrubland, and riparian nesting birds within the boundary of Salt Plains NWR during late May, June, and early July.

Partnerships/Cooperators/Linkages:

The database is maintained by Rocky Mountain Bird Observatory. Their database includes survey data collected under a similar protocol throughout the grasslands of the central US, the Desert Southwest, and the Rocky Mountains. The database includes survey data from the National Park Service (NPS), Bureau of Land Management, the U.S. Forest Service, and state-agency partners. Other refuges in USFWS Region 2 have expressed interest in using this protocol.

Protocol status:

Survey will follow: Hanni, D.J., C.M. White, R.A. Sparks, J.A. Blakesley, J.J. Birek, N.J. Van Lanen, and J.A. Rehm-Lorber. 2011. Field protocol for spatially-balanced sampling of landbird populations. Unpubl. report., Rocky Mountain Bird Observatory, Brighton, CO.; available online at: http://rmbo.org/v3/OurWork/Science_/Protocols.aspx. Sampling intensity and spatial design will be modified for Salt Plains NWR to address site specific needs related to long-term management questions.

The RMBO protocol (Hanni et al. 2011) is being used by multiple refuges and is being brought into I&M format through a contract between Headquarters I&M (Fort Collins) and RMBO.

11. White-tailed Deer Herd Health Assessment (FF02RKSP00-007)

A periodic survey of the white-tailed deer population (*Odocoileus virginianus*) on Salt Plains NWR is needed to determine herd health and/or abundance. Results will be used to determine if changes in white-tailed deer hunting are warranted. White-tailed deer hunting provides recreational opportunities for the public and is a compatible use for Salt Plains NWR. White-tailed deer populations on the refuge and throughout the state of Oklahoma are abundant and without management could potentially degrade integrity of refuge resources. Herd assessments could be used to determine if an expansion of refuge hunt programs are warranted. This survey will be used to inform refuge management objectives, including; CCP Goal 2, Objective 4.

Population/Community of interest:

The white-tailed deer population within refuge boundary.

Partnerships/Cooperators/Linkages:

Southeast Cooperative Wildlife Disease Study, ODWC.

Protocol status:

No site-specific protocol is currently developed. Similar efforts are currently being conducted at other Refuges, and it is expected that Southeast Cooperative Wildlife Disease Study out of the University of Georgia will have methods that will serve as a survey protocol framework.

12. Freshwater Mussel Survey (FF02RKSP00-020)

This survey would assess presence/absence of freshwater mussels within Salt Plains NWR watersheds. Currently, there is no information for Salt Plains NWR regarding mussels and their distribution; however, five species have been identified within one tributary after being exposed during drought conditions. Based on information from Kansas Parks and Wildlife there are distribution maps for species upstream of the Refuge. No federally-listed mussels are expected to be found within Salt Plains NWR. Determining the presence of mussels and the population assessment is an indirect measure of the water quality, particularly with potential point sources of pollution upstream of the refuge. Freshwater mussels are good indicators of water quality and quantity that could also influence other trust resources. With the potential impacts of climate change, water quality and quantity are expected to become scarce and more vulnerable. Freshwater mussels can be related to habitat conditions of prairie rivers and streams. This survey will be used to inform refuge management objectives, including; CCP Goal 2, Objective 1; CCP Goal 4, Objective 3.

Population/Community of interest:

Freshwater mussels within Salt Plains NWR watershed.

Partnerships/Cooperators/Linkages:

Oklahoma Ecological Services Field Office, Oklahoma State University Cooperative Fish and Wildlife Research Unit, and other Universities.

Protocol status:

No site-specific protocol or survey protocol framework is currently developed.

13. Fire Effects Monitoring (FF02RKSP00-021)

As part of an adaptive habitat management strategy, it is important to relate habitat changes to corresponding treatments. This monitoring effort will record important fire behavior characteristics taken during prescribed burning operations and effects within a short time period following burns. Relating fire behavior characteristics to habitat management objectives allows for modifications within the prescribed fire management plan to achieve desired habitat conditions for priority species. Data taken for this monitoring effort is done during prescribed fire activities, and in the past resources have not been available to perform this effort. This survey will be used to inform refuge management objectives, including; CCP Goal 2, Objective 3, 6, 7, & 9.

Population/Community of interest:

Monitor prescribed fire effects in regards to habitat management objectives.

Partnerships/Cooperators/Linkages:

I&M Program, zone Fire Program. This monitoring effort will be linked to surveys 7- Invasive Plant Monitoring (FF02RKSP00-015) and 8- Vegetation Monitoring (FF02RKSP00-014).

Protocol status:

Current survey protocols were adapted from FEAT and FireMon Integration (FFI) developed in cooperation with the National Park Service, U.S. Forest Service, Systems for Environmental Management and Spatial Dynamics and funded by the National Interagency Fuels Coordination Group. A site-specific I&M survey protocol will be developed.

Surveys Not Selected

Interior least tern nest monitoring and colony point counts (FF02RKSP00-002) – This survey is very time consuming and labor intense. Given present staffing and funding this survey is not a high priority for Salt Plains NWR. This was an intensive survey of the salt flats for adult breeding colonies and nest locations. A peak breeding season survey will be used to submit breeding numbers to the species coordinator. Data collected during this survey does not currently inform refuge management. It would take more effort than is currently available at the expense of higher priority surveys to meet the minimum standards of the I&M policy.

Mid-winter Waterfowl Survey (FF02RKSP00-005) – This survey has historically provided the estimated distribution and abundance of continental populations of wintering waterfowl during early January. This information has been used to allocate harvest among Flyways, but does not factor into annual harvest regulations or inform refuge management. The refuge has provided mid-winter waterfowl numbers to ODWC; these numbers were collected during weekly waterfowl surveys. At this time, surveys that measure waterfowl habitat (estimate energetic carrying capacity) are expected to replace monthly waterfowl surveys. The refuge is willing to participate in this survey if continued and supported by the Migratory Bird Management Office. A Flyway-level survey framework and site-specific protocol is needed to continue this survey in the future.

Mid-winter Eagle Survey (FF02RKSP00-004) – This is a U.S. wide effort coordinated by the National Wildlife Federation. The effort is to gather information on the distribution and abundance of Bald (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*) throughout the 48 contiguous states. Salt Plains NWR submits annual counts through the Corps of Engineers. There are three major roost areas on the refuge and two known areas just off the refuge. The refuge is willing to participate in this survey if continued and supported by the Migratory Bird Management Office. A national survey framework and site-specific protocol is needed to continue this survey in the future.

Christmas Bird Count (FF02RKSP00-008) – This is not a FWS led or needed survey. This survey is conducted with volunteers through the Audubon Society and is maintained to promote public participation in the outdoors. Data is not used by the Refuge, and does not pertain to refuge management, but data is rolled up and used by the Audubon Society at the regional/national level. No protocol is likely to be developed to meet I&M policy standards.

Mourning Dove (*Zenaida macroura*) Trapping and Banding (FF02RKSP00-010) – This survey was not selected. This survey effort is time consuming and costly with little return (1 dove trapped in last 3 years). While dove trapping continues to be a priority for the Migratory Bird Management Office, this survey would be best suited in a more successful site.

Herp Trapping (FF02RKSP00-012) – Salt Plains NWR currently has an inventory list that is fairly complete from previous trapping efforts using herp arrays with drift fences, funnel traps, and pitfall traps. If future surveys were to be conducted on the Refuge, this would be a reconnaissance survey to maintain species list, and the Refuge would partner with local

universities. No species are currently a high priority nor does the refuge support any potential surrogate species.

Small and Meso-mammal Trapping (FF02RKSP00-013) – This would be a reconnaissance survey to maintain species list. The intent of these surveys is not tied to any priority species of the Refuge. Salt Plains NWR would most likely partner with local university to perform these surveys with guidance from the Refuge. No protocol would be developed because the survey does not tie directly to refuge management or priority species.

Whooping Crane Sighting Reporting (FF02RKSP00-0XX) – This is a flyway reporting system for the monitoring of whooping cranes during spring and fall migration. This is a priority of the FWS; however, a flyway survey protocol would need to be developed.

White-tailed Deer Spotlight Survey (FF02RKSP00-0XX) – This survey was not selected to be included in the IMP because the refuge will begin monitoring white-tailed deer conditions using a deer herd health assessment (FF02RKSP00-007). The spotlight survey provides a long-term index of the white-tailed deer population trend. Current survey methods will most likely not meet I&M policy standards.